REMARKS

Claims 1-16 and 18-28 are pending in the application upon entry of the amendments and new claims. Claims 1 and 13-16 have been amended for consistency and to more particularly describe certain aspects of the invention. Claims 21-28 have been added to further describe the invention. Favorable reconsideration in light of the amendments, the new claims, and the remarks which follow is respectfully requested.

The Amendments and Prosecution History

The independent claims have been amended so as to define the patentable subject matter. The claims function to disclaim imaging systems that do not have the recited relationship between two or more of diffraction limited spot size of the lens, numerical aperture of the lens, wavelength of light, and pixel pitch.

Claims 1 and 13-16 have generally been amended into their original form. New dependent claims 21 and 22 generally correspond with original claims 3 and 17. New independent claims 23 and 26 contain the subject matter of original claim 1 and further define the relationship between the optical parameters of the lens and the projected pixel pitch size. New dependent claim 27 generally corresponds with original claim 17. New independent claim 28 generally corresponds with original claims 1 and 3 and further defines the relationship between the optical parameters of the lens and the projected pixel pitch size.

The Obviousness Rejections

Claims 1-10, 12-16, and 18-20 have been rejected under 35 U.S.C. § 103 over Tsuyuki et al in view of Takamine et al. Tsuyuki et al relates to an endoscope (a thin, lighted tube used to look at tissues inside the body) with an optical system and an imaging section attached to the rear end of the endoscope. The imaging section contains an stop unit having a variable stop and variable aperture, an imaging lens system, a focus lens system, and an image sensor. The positions of the stop unit, the

imaging lens system, and the image sensor are constant along the optical axis while the focus lens system can be moved along the optical axis. Referring to Figure 4 of Tsuyuki et al, the imaging section 42 is shown aligned along an optical path (un-numbered dashed line) with the end (eyepiece) of an endoscope 41. The imaging section 42 includes imaging lens system 43, variable stop 44, and CCD image sensor 48, the CCD sensor has an array of light receptors that have a pixel pitch.

The Examiner contends that the lens system 43 is inherently compatible to the camera and thus, to the pitch and a desired resolution of the CCD sensor and thus, the optical system. Applicant respectfully disagrees.

Tsuyuki et al fails to provide a lens that has its optical parameters, such as a resolution parameter or the diffraction limited spot size, functionally related to the pixel pitch of the sensor so that the lens substantially maps a portion of an object having the desired resolution to the pixel pitch of the light receptors. In fact, Tsuyuki et al fails to teach or suggest mapping the diffraction limited spot size to pixel pitch. Tsuyuki et al relates to optimizing its depth of field in terms of its aperture stop diameter while mitigating any affect on resolving power. Tsuyuki et al considers pixel pitch in relation to aperture size. Aperture size is not an optical parameter of a lens.

As required by claim 1, the lens is optically associated with the optical sensor so that the lens has optical parameters which are functionally related to the pixel pitch of the light receptors of the optical sensor and the desired image resolution of the optical system. That is, the lens is operative to substantially map a portion of an object having the desired resolution to the pixel pitch of the light receptors. Tsuyuki et al fails to teach or suggest these aspects of the invention.

The Examiner further contends that the lens 43, along with the variable stop 44, can map an image of an object to associated light receptors of the CCD sensor. Applicant respectfully disagrees.

First, it is noted that claim 1 requires the lens to substantially map a portion of an object *having a desired resolution along the optical path* to *one* light receptor of the

sensor; not map an image of an object to associated light receptors of the sensor as stated by the Examiner. Nevertheless, in order for a lens to substantially map a portion of an object having a desired resolution along the optical path to one light receptor, the light receptor having a pixel pitch, the lens must have a resolution parameter that is correlated to the light receptor/pixel pitch. Neither the imaging lens nor the focusing lens of Tsuyuki et al have a resolution parameter that is correlated to the pixel pitch of its CCD sensor.

With specific regard to new claims 23 and 26 and 28, Tsuyuki et al fails to teach or suggest a lens optically associated with the optical sensor along an optical path, the lens configured with optical parameters functionally related to a projected pixel pitch size and a desired image resolution of the optical system, such that the lens is configured to match the projected pixel pitch size to within 20% or 5% of a diffraction limited spot of the lens.

Specifically with regard to claim 13, Tsuyuki et al fails to teach or suggest selecting a desired minimum spot size resolution for the system and providing a lens configured with optical parameters based on the pixel pitch and the desired minimum spot size. Tsuyuki et al concerns selecting an aperture to optimize depth of field given a certain pixel pitch and brightness. In other words, Tsuyuki et al would not have motivated one skilled in the art to make an imaging system by selecting a desired minimum spot size resolution for the system and providing a lens configured with optical parameters based on the pixel pitch and the desired minimum spot size.

The Examiner claims that the features of claims 2, 6, and 14-16 are inherently disclosed in Tsuyuki et al as the Examiner argues that magnification is inherently related to a desired resolution and pixel pitch, and thus to their ratio. Applicant again respectfully disagrees.

In Tsuyuki et al, magnification is related to the strength/power of the imaging lens and focusing lens. Contrary to Tsuyuki et al, in claim 2, magnification is related to the ratio of the desired resolution and pixel pitch. Generally speaking, the system of Tsuyuki et al is not space quantized via the diffraction limit, but instead aperture quantized as its system requires the modifiable aperture. In other words, the system of the claims and the system of Tsuyuki et al are fundamentally different such that Tsuyuki et al does not inherently describe various aspects of the claimed invention.

With specific regard to claim 1 submitted in the Reply dated May 8, 2003, which describes a relationship between numerical aperture, wavelength, and pixel pitch by formula, the Examiner cites Takamine et al. This feature is now described in claims 19, 21, 25, and 27. Takamine et al relates to a CD player (optical disk apparatus) and CDs/DVDs (optical disks). The disk of Takamine et al has grooves formed with a pitch equal to or greater than λ/NA. The Examiner concludes that NA is thus equal or less than λ/Y; and that inherently NA is twice less than λ/Y. Applicant again respectfully disagrees.

The pitch referred to in Takamine et al corresponds to groove/pit pitch on a disk. Pitch in the claimed invention corresponds with pixel pitch of a sensor. Although the word "pitch" is employed in both situations, groove/pit pitch and pixel pitch are quite different. A grooves and pits in a disk are the slight depressions or dimples on the surface of the disk that allow a laser pickup to distinguish between the digital 1's and 0's that embody data. In Takamine et al, pitch refers to the distance/size among the pits. The disk is NOT a sensor. The grooves and pits are NOT pixels. Pixels convert light to an electrical signal. Moreover, the optical disk apparatus of Takamine et al is NOT and imaging system. While it is acknowledged that Takamine et al uses such words as pitch, NA, lamda, light beam, and the like, Takamine et al is non-analogous art and is not properly combinable with Tsuyuki et al.

One skilled in the art would not have modified Tsuyuki et al to have a pixel pitch greater than λ/NA, as "taught" by Takamine et al because Takamine et al does not discuss pixel pitch, Takamine et al discusses groove/pit pitch.

Claim 11 has been rejected under 35 U.S.C. § 103 over Tsuyuki et al and Takamine et al in view of Pollard et al. Pollard et al relates to a method of reconstructing an image from data captured by a sensor. Although the Examiner does not cite any specific reference in Pollard et al, Pollard et al is cited for the proposition that an LED can be used as an illumination source.

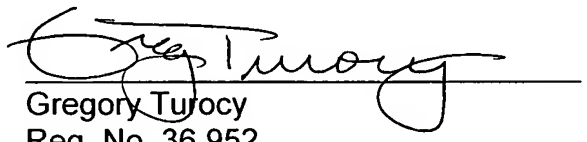
Pollard et al does NOT cure the deficiencies of Tsuyuki et al and Takamine et al because Pollard et al fails to disclose, teach, or suggest, the required relationship between optical parameters of a lens and sensor pixel pitch.

Should the Examiner believe that a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

In the event any fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to our Deposit Account No. 50-1063.

Respectfully submitted,

AMIN & TUROCY, LLP



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